PB-217 705

REPORT ON PROPOSED STREAM POLLUTION STUDIES OF THE KANSAS RIVER WITH RECOMMENDATIONS ON THE PROCEDURE TO BE ADOPTED

H. H. Wagenhals

Public Health Service
Washington, D. C.

November 1921

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 217 705

LIBRARY
SANITARY ENGINEERING CENTER
CINCINNATI, OHIO

REPORT ON PROPOSED STREAM POLLUTION STUDIES OF THE KANSAS RIVER WITH RECOMMENDATIONS ON THE PROCEDURE TO BE ADOPTED.

By

H. H. Wagenhals,
Associate Sanitary Engineer,
United States Public Health Service.

November, 1921.

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

REPORT ON PROPOSED STREAM POLLUTION STUDIES OF THE KANSAS RIVER WITH RECOMMENDATIONS ON THE PROCEDURE TO BE ADOPTED.

By

H. H. Wagenhals,
Associate Sanitary Engineer,
United States Public Health Service,

November, 1921.

In the past it has been the general policy of the State Board of Health of Kansas to permit the use of the Kansas River and its tributaries for the disposal of sewage in an untreated state or with just sufficient treatment to prevent nuisances in the vicinity of sewer outlets. The rivers and streams of this drainage system have, with but one exception, successfully disposed of such sewage without the creation of nuisances.

In 1917 the City of Lawrence applied for and obtained permission to use the Kansas River as a source of water supply, the water being treated by coagulation, sedimentation, mechanical gravity filtration and chlorination, employing processes which softened the water at the same time.

Lawrence was followed by Topeka, where a softening and purification plant, using coagulation, sedimentation, mechanical gravity filtration and chlorination, is being installed at the present time. There is now also in the hands of the State Board of Health an application by a third city for the use of the Kansas River as a source of water supply.

The State Board of Health realized that, if the Kansas River system is to be used as a source of water supply, it will probably

/

be necessary to change the policy of the Board as regards its use for sewage disposal, and to require more universal and more complete methods of sewage treatment.

It was, therefore, decided to undertake a study of the Kansas River and its tributaries to ascertain their condition, the effect of the sewage being discharged into them at the present time, their probable capacity to receive sewage with due regard to the rights of cities desiring to use it as a source of water supply, and the extent of sewage treatment required to maintain the rivers in proper condition for their use as a water supply.

Request was made to the United States Public Health Service for assistance in making these studies, and as a result the writer was directed to confer with the Secretary of the State Board of Health, and to make recommendations covering the nature of the studies and the data to be secured. After the completion of the studies he is to be further available to assist in the interpretation of the data collected and to make further recommendation based on these data.

In accordance with these orders the writer spent the period from October 31 to November 4 in conference with officials of the Kansas State Board of Health and in inspections of the Kansas River and its tributaries. As a result of these conferences and inspections, the following general procedure is recommended.

It is evident at the start that an intensive study of stream pollution and of stream self-purification cannot be undertaken

with the personnel or funds available, and that the work to be undertaken must be designed to secure the most valuable data for the immediate use of the State Board of Health that can be obtained with the available facilities, with the elimination of much data which, while desirable, is not of such immediate importance.

The data to be collected under these restrictions can be divided into three main classes: first, those which can be secured from various agencies which already have them available; second, those which can be secured by correspondence with the aid of questionnaires; and third, those which can be secured only by special studies in the field and the laboratory. It is to this third class that most of the time of the personnel and most of the money available must be directed.

The data which can and should be secured from the various agencies may be listed as follows:

(1) Stream flow measurements. The United States Geological Survey maintains a number of gauging stations on the Kansas River and its tributaries. The daily measurements for all such stations for the period covered by the survey should be secured, and in addition, the date, duration and amount of the minimum and maximum flows, together with average low water flows recorded during the life of these stations.

(2) The extent, density and location of the population on the drainage area, which are available from the published records of the United States Census Bureau.

(3) Morbidity and mortality statistics covering typhoid fever. These are already on file with the State Board of Health.

The data which can and should be secured by correspondence with the aid of questionnaires and supplemented possibly by a few field surveys are as follows:

(1) The number of people in communities who are contributing sewage to the rivers both through direct connection to the sewers and through night soil dumped into the sewers. As it is possible that at many places this number may not be definitely known, it may be necessary to estimate it. For this purpose the questionnaire should call for the number of connections to the sewers, the number of metered water services and the number of unmetered water services having water closet connections.

(2) Industrial wastes are, it is stated, of relatively little importance, there being none besides creameries and slaughter houses and only a small number of these. Of the creameries, it is desirable to know the amounts of milk received, the nature of the business, whether a skimming station, a butter plant, or a cheese factory, the amount of product produced, and the nature of the wastes discharged, whether merely wash water, or whey, etc. Of the slaughter house, the information secured should cover the number and kind of animals killed per month, and the extent of waste recovery.

Data relative to the actual conditions of the water in the

rivers can be obtained only by field surveys and analyses. In view of the information to be obtained from various agencies and by correspondence, and because the sewage entering the rivers has produced nuisances at but one point, the field surveys can be largely eliminated, except as they can be made in connection with the collection of samples.

As the studies are undertaken with the primary object of protecting present and possible future water supplies from the rivers of this drainage system, the main effort should be directed to bacteriological analyses, 37-degree C. count and quantitative B.coli determinations, to the practical exclusion of chemical analyses.

Great care must be taken in the selection of the sampling points and in the collection of samples, in order that they may show the effect of pollution factors and be representative of the condition of the river as a whole at the sampling point.

In the present investigation it will be best to confine the analytical studies to the Kansas River proper and to the Smoky Hill except that samples should be taken from each main tributary to determine the character of the water contributed by it. Sampling points should, therefore, be selected above and below each important source of pollution and each large tributary.

As pollution entering watercourses may travel for considerable distances without much diffusion through with the water of the river, the sampling points should, so far as possible, be selected

below good mixing points such as rapids or dams. In every case they should be not less than two miles below sources of pollution or mixing points.

To secure samples which are representative of the water in the stream, errors due to poor diffusion should be reduced by taking several samples at each sampling point. It is probable that at least three and preferably four samples will have to be taken at points spaced about equally across the river. These should be taken about mid-depth.

The taking of midstream samples necessitates that sampling points be selected so far as possible at bridges, from which the sample bottles can be dropped on a rope. The only other methods are with a boat when the river is high enough, or by wading into the river. This last method is feasible only at times of low water and during warm weather.

To take samples at mid-depth it will be necessary to have a collecting device with which the stopper of the sample bottle can be withdrawn under water.

The frequency with which samples are taken depends upon the personnel and funds available. The State Sanitary Engineer estimated that it will probably be possible to take samples once every two or three weeks. It is probable that such a schedule, if continued for twelve months, will provide the essential data desired by the Board of Health.

There are two available methods for actual sample taking.

By one method bottles are shipped to local residents who take the samples, park them in ice, and express them to the State Board of Health laboratory at Lawrence. By the other method, an official of the State Board of Health will make trips over the river, collecting all samples himself and shipping them, iced, to Lawrence.

In this investigation it is recommended that the second method be used. It will be extremely difficult to secure local residents at various sampling points who can be relied upon to take samples regularly and properly. If samples were to be taken daily and a reasonable compensation paid, such samples could be secured, but they would need constant supervision and frequent changes. Where the number of samples taken are as few as they must be in these studies, each sample is of too great importance to entrust its collection to only partially trained men who, because of limited funds, can be given only a nominal remuneration. In addition, a trained man going over the territory can make valuable observations and exercise judgement in taking samples under abnormal conditions.

It is estimated by the State Sanitary Engineer that the bacteriologist of the Water and Sewage Division of the Board of Health could be available for sampling trips every two or three weeks. Whether these trips can be made more advantageously or economically by automobile or by train can be decided only after the exact sampling points have been established.

In judging a river for use as a water supply, the average conditions of the water must form the basis. It is most desirable, therefore, that studies, such as this one on the Kansas River, be planned to include a year's cycle. It may be possible to discontinue the work at an earlier date if, for example, it is found that even at times of greatest dilution of pollution the quality of the water is below that commonly accepted as a maximum safe load for a water purification plant, where it contains more than 500 B.coli per 100 c.c. As such definite results cannot be foreseen, the investigation should be planned to continue for at least twelve months.

These recommendations are submitted with the understanding that, exclusive of laboratory costs and transportation of samples, probably not more than $1,000 will be available for the investigation. This must cover field expenses of the man collecting samples, possible temporary employment of additional personnel, and miscellaneous expenses. This, of necessity, materially limits the scope of the studies. They become more a water supply survey than a stream pollution investigation. It is believed, however, that the water supply question is the one of most immediate concern to the State Board of Health, and the studies as outlined should provide data sufficient for the establishment of future policies of the State Board of Health in protecting the Kansas River as a source of water supply.